Biodiversity and Energy Online Mapping

About the layers

Layer: Modeled Bat Summer Distributions
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Layer developed by: The New York Natural Heritage Program

Short Description: This layer depicts the predicted richness (number) of up to 3 species of bat that occur in New York during the summer. The probability of suitable habitat for each species was modeled and converted to the predicted presence (1) or absence (0) of suitable habitat. These layers were then summed across all species to yield the number of species for which suitable habitat was predicted to be present in each cell.

Why this layer matters:
Due to their high mobility, large home range sizes, and frequent movements between roosting and foraging locations within summer habitat, bats are best managed at a landscape scale (Lacki et al. 2007). Little brown bats are of conservation concern due to dramatic declines from white-nose disease (NYS DEC unpublished data) and the status of migratory tree bats, such as the hoary bat and eastern red bat, are not well known but they are thought to be uncommon in New York (Stegmann and Hicks 2008). Understanding where these species occur throughout the landscape is important for conservation-planning for bats and may be important for mitigation as well.

Source: Location data came from two sources a statewide acoustic dataset (2009-2010) from the NYS Department of Environmental Conservation and a mist-netting dataset that was a compilation of many independent studies (2003-2010). Data sources did not include any sampling from Long Island so we recommend caution in using the models to predict species locations there.

Processing Overview:
1. We examined eight of the nine bat species occurring in New York during the summer and created models for 3 species that had over 500 presence locations and low error rates for predicting presence (0.08-0.32) and absence (<0.01 for all).
2. We attributed each 30-m cell with 57 environmental variables (see Howard and Schlesinger [2012]).
3. We compared the environmental characteristics of known presence cells to non-detections, locations that were sampled but where no individual of a particular species was found, using Random Forest analysis.
4. We used the results of this model to predict the probability of suitable habitat for each species.
5. For each species, we attributed any location (raster cell) with greater than 50% probability of suitable habitat as ‘suitable’ (1) and all locations with lower probabilities as ‘unsuitable’ (0).
6. For each of the 3 species, we summed the 0/1 to arrive at the number of species predicted to have suitable habitat in each cell.

This project was conducted by The Nature Conservancy of New York in close collaboration with The New York Natural Heritage Program, a program of the State University of New York School of Environmental Science and Forestry. This project is made possible with funding from the New York State Energy Research and Development Authority.

Models passing validation::

Scientific Name	Common Name	Model error[1]	Presence error	Absence error
Eptesicus fuscus[2]	Big Brown Bat	0.041	0.195	0.008
Lasiurus borealis[3]	Eastern Red Bat	0.024	0.318	0.003
Lasiurus cinereus[3]	Hoary Bat	0.024	0.291	<0.001
Myotis lucifugus[3]	Little Brown Bat	0.025	0.266	0.004

1. The model error rate refers to the "out-of-bag" error rate in Random Forest analysis that uses a subset of the original dataset to validate the model (Breiman 2001).
2. This species was not included in the stacked spatial model because it is currently common, widespread, and not a conservation priority.
3. These species were included in the stacked spatial model.

Models that did not pass validation:

Scientific Name[1]	Common Name	Model error[2]	Presence error	Absence error
Myotis leibii	Small-footed Bat	0.035	0.917	0
Myotis septentrionalis	Northern Bat	0.008	0.791	0.001
Myotis sodalis	Indiana Bat	0.004	0.750	0.007
Periomyotis subflavus	Tri-colored Bat	0.002	0.574	<0.001

1. The number of detections (6) of silver-haired bats (*Lasionycteris noctivagans*) prohibited modeling this species.
2. The model error rate refers to the "out-of-bag" error rate in Random Forest analysis that uses a subset of the original dataset to validate the model (Breiman 2001).

Literature Cited

Breiman, L., 2001. Random forests. Machine Learning 45, 5–32.

Howard, T., and M. Schlesinger. 2012. PATHWAYS: Wildlife Habitat Connectivity in The Changing Climate of the Hudson Valley. New York Natural Heritage Program, Albany, NY.

Lacki, M.J., Hayes, J.P., Kurta, A., 2007. Bats in forests: conservation and management. The Johns Hopkins University Press, Baltimore, MD.

Stegmann, E., Hicks, A., 2008. Bats of New York. New York State Conservationist 62(4): 19-22.

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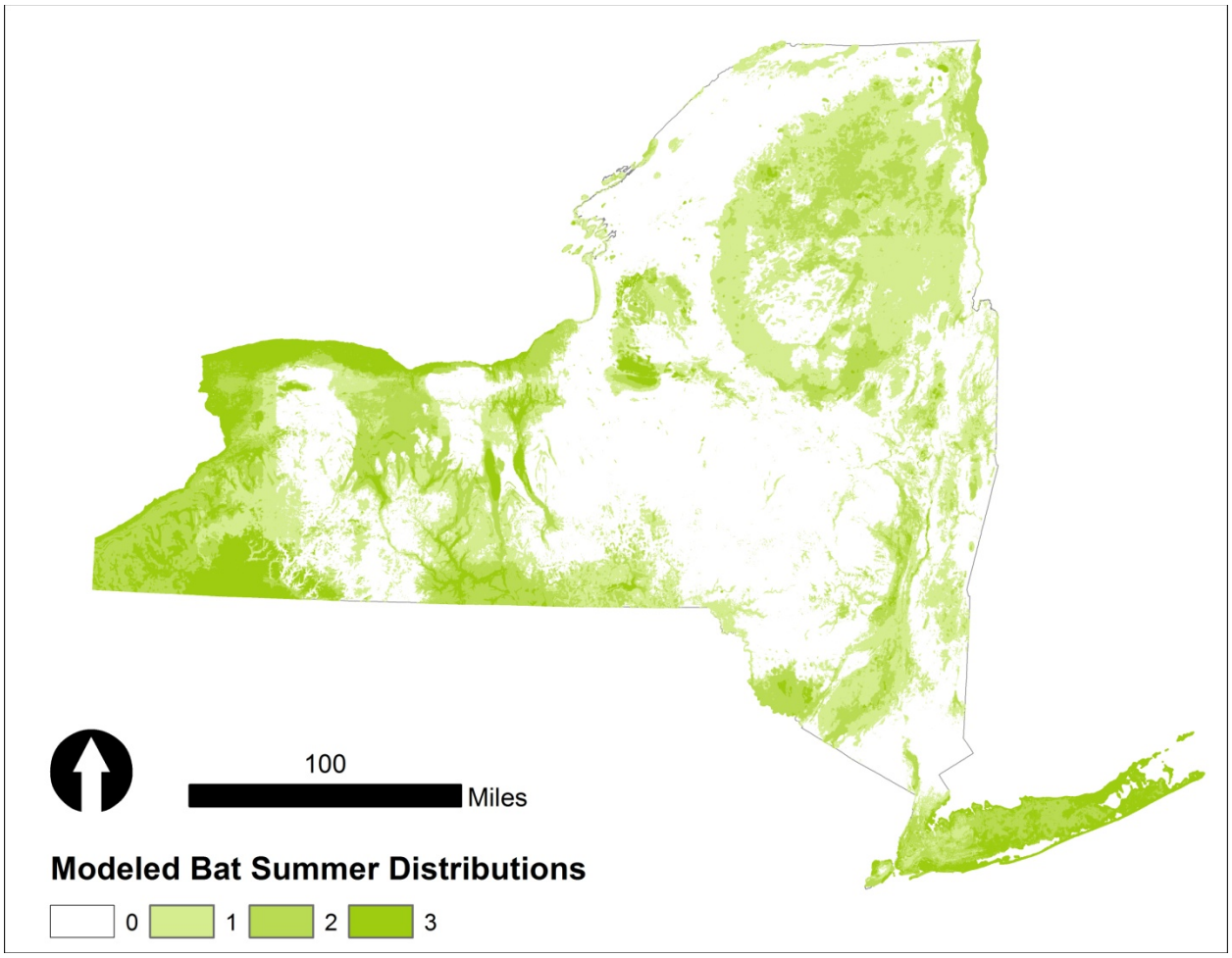
http://www.ebd.mapny.info



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